

CLAIMS

What is claimed is:

1. A system for processing compressed data, said compressed data including a first picture and a subsequent second picture, each of said pictures including a plurality of bits starting 5 with a first bit, said system comprising:

a decoder configured to receive said compressed data and decompress said compressed data, said decoder having a pre-decoder buffer configured to buffer said compressed data;

wherein said first bit of said first picture enters said pre-decoder buffer at a first 10 time and said first bit of said second picture enters said pre-decoder buffer at a second time, and wherein said first bit of said first picture leaves said pre-decoder buffer at a third time and said first bit of said second picture leaves said pre-decoder buffer at a fourth time; and

wherein a difference based on said second time and said first time is not less than a difference based on said fourth time and said third time.

15 2. The system of claim 1, wherein said second time less said first time is greater than or equal to said fourth time less said third time.

3. The system of claim 1, wherein said second time less said first time is greater than or equal to said fourth time less said third time less a fixed time.

20 4. The system of claim 1 further comprising an encoder, wherein said encoder generates said compressed data and transmits said compressed data to said decoder so as to ensure that said difference based on said second time and said first time will not be less than said difference based on said fourth time and said third time.

5. A method for processing compressed data through a pre-decoder buffer, said

compressed data including a first picture and a subsequent second picture, each of said pictures including a plurality of bits starting with a first bit, said method comprising:

storing said first bit of said first picture in said pre-decoder buffer at a first time;

storing said first bit of said second picture in said pre-decoder buffer at a second

5 time;

removing said first bit of said first picture from said pre-decoder buffer at a third time; and

removing said first bit of said second picture from said pre-decoder buffer at a fourth time;

10 wherein a difference based on said second time and said first time is not less than a difference based on said fourth time and said third time.

6. The method of claim 5 further comprising: decompressing said compressed data.

7. The method of claim 5, wherein said second time less said first time is greater than or equal to said fourth time less said third time.

15 8. The method of claim 5, wherein said second time less said first time is greater than or equal to said fourth time less said third time less a fixed time.

9. The method of claim 5, wherein an encoder generates said compressed data and transmits said compressed data to said pre-decoder buffer so as to ensure that said difference based on said second time and said first time will not be less than said difference based on said 20 fourth time and said third time.

10. A system for processing data, said data including a plurality of compressed pictures, each of said compressed pictures including a plurality of bits starting with a first bit, said system comprising:

a decoder configured to store said plurality of compressed pictures in a pre-decoder buffer;

wherein said data further includes a pre-decoder buffer delay for each of said plurality pictures, and wherein each of said plurality of pictures is removed from said pre-decoder buffer at a time calculated by adding said pre-decoder buffer delay to a removal time of its immediate previous picture.

11. The system of claim 10, wherein said pre-decoder buffer delay for each of said plurality pictures is an integer an integer multiple of a clock tick.

12. The system of claim 11, wherein the clock tick is an integer multiple of a picture rate.

13. The system of claim 10 further comprising an encoder, wherein said encoder transmits said pre-decoder buffer delay for each of said plurality pictures.

14. A bitstream generated by a system, said bitstream comprising:

a plurality of compressed pictures, each of said compressed pictures including a

15 plurality of bits starting with a first bit; and

a pre-decoder buffer delay for each of said plurality pictures;

wherein a decoder stores said plurality of compressed pictures in a pre-decoder buffer, and wherein each of said plurality of pictures is removed from said pre-decoder buffer at a time calculated by adding said pre-decoder buffer delay to a removal time of its immediate previous picture.

15. The bitstream of claim 14, wherein said pre-decoder buffer delay for each of said plurality pictures is an integer an integer multiple of a clock tick.

16. The bitstream of claim 15, wherein the clock tick is an integer multiple of a

picture rate.

17. The bitstream of claim 14, wherein said system comprises an encoder, wherein said encoder transmits said pre-decoder buffer delay for each of said plurality pictures.

18. A method for processing data using a pre-decoder buffer, said data including a plurality of compressed pictures, each of said compressed pictures including a plurality of bits starting with a first bit, said data further including a pre-decoder buffer delay for each of said plurality pictures, said method comprising:

storing said plurality of compressed pictures in said pre-decoder buffer;

calculating a time for removing each of said plurality of pictures by adding said

10 pre-decoder buffer delay to a removal time of its immediate previous picture; and

removing each of said plurality of pictures from said pre-decoder buffer at said time.

19. The method of claim 18, wherein said pre-decoder buffer delay for each of said plurality pictures is an integer an integer multiple of a clock tick.

15 20. The method of claim 19, wherein the clock tick is an integer multiple of a picture rate.

21. The method of claim 18, wherein an encoder transmits said pre-decoder buffer delay for each of said plurality pictures.

22. A system for processing compressed data, said system comprising:

20 a video coding layer;

a network adaptation layer;

a first set of parameters for said video coding layer; and

a second set of parameters for a multiplex of said video coding layer and said

network adaptation layer.

23. The system of claim 22, wherein said video coding layer includes a bitstream having video slices.

24. The system of claim 22, wherein said network adaptation layer includes a
5 bitstream having syntactic structures.

25. The system of claim 24, wherein said syntactic structures include picture attributes, parameter sets and start codes.

26. A system comprising:

an encoder configured to generate compressed data, said compressed data
10 including a first picture and a subsequent second picture, each of said pictures including a plurality of bits starting with a first bit; and

a transmitter configured to time transmission of said compressed data such that
a pre-decoder buffer is capable of inputting said first bit of said first picture at a first time and
inputting said first bit of said second picture at a second time, and said pre-decoder buffer is
15 further capable of outputting said first bit of said first picture at a third time and outputting said
first bit of said second picture at a fourth time; and

wherein a difference based on said second time and said first time is not less than
a difference based on said fourth time and said third time.

27. The system of claim 26, wherein said second time less said first time is greater
20 than or equal to said fourth time less said third time.

28. The system of claim 26, wherein said second time less said first time is greater
than or equal to said fourth time less said third time less a fixed time.

29. A method of analyzing a bitstream, said bitstream having a plurality of

compressed pictures and a plurality of messages, said method comprising the steps of:

locating a buffering information message including bit rate information and buffer size information;

extracting said bit rate information and said buffer size information from said buffering

5 information message;

computing a bit rate and a buffer size from said bit rate information and buffer size information;

selecting a random access point in said bitstream;

locating a buffering period message following said random access point;

10 extracting random access buffering information from said buffering period message;

computing from said random access buffering information a picture removal time associated with the first picture following said buffering period message;

wherein for each compressed picture in the bitstream following said first picture, said method further comprising:

15 locating a picture message including picture removal time delay information;

extracting said picture removal time delay information from said picture message;

computing from said picture removal time delay information a picture removal time of said compressed picture;

wherein for each compressed picture following said buffering period message, said

20 method further comprising:

counting the number of bits representing said compressed picture;

computing an initial arrival time and a final arrival time of said compressed picture, wherein said initial arrival time is equal to an earlier of said final arrival time of the

immediately previous compressed picture or equal to a sum of a fixed time plus a sum of removal delays of all of said compressed pictures between said first compressed picture following said buffering period message and said compressed picture, including said compressed picture, and wherein said final arrival time is equal a sum of said initial arrival time and a time
5 calculated based on the number of bits associated with said compressed picture at said bit rate;
and

verifying that a difference between said final removal time and said initial arrival time does not exceed the time for reaching said buffer size at said bit rate.

30. The method of claim 29 further comprising the step of verifying for each of said
10 compressed pictures that said final arrival time precedes said removal time.

31. The method of claim 29 further comprising the step of verifying that said initial arrival time of each of said compressed pictures is equal to said final arrival time of the immediately previous compressed picture.